Figure S1: Multiple filtered waveforms. The filtering range is located in the upper right corner of each waveform. (a) The distance between the station pair is 14.2128 km. (b) The distance between the station pair is 18.8153 km. (c) The distance between the station pair is 32.8185 km.
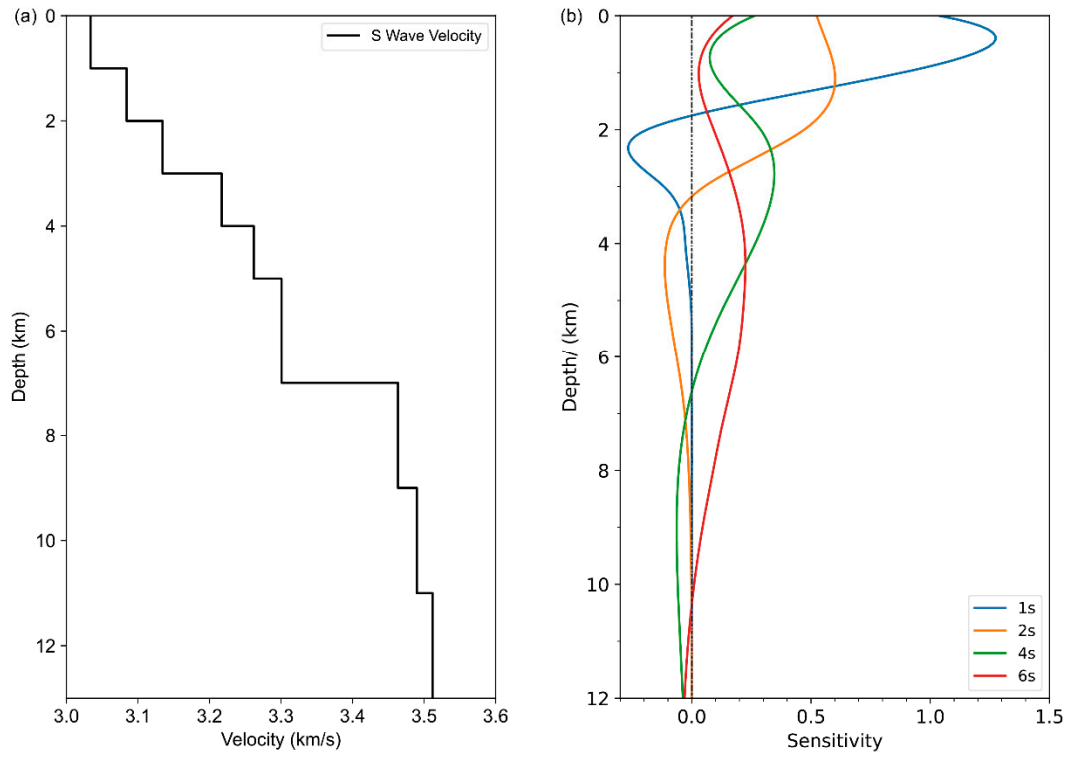
Figure S2: (a). The initial 1-D S wave model utilized in this research. (b). Normalized depth sensitivity kernels for S-wave velocity regarding the Rayleigh wave group velocity ranging from 1 to 6 seconds.
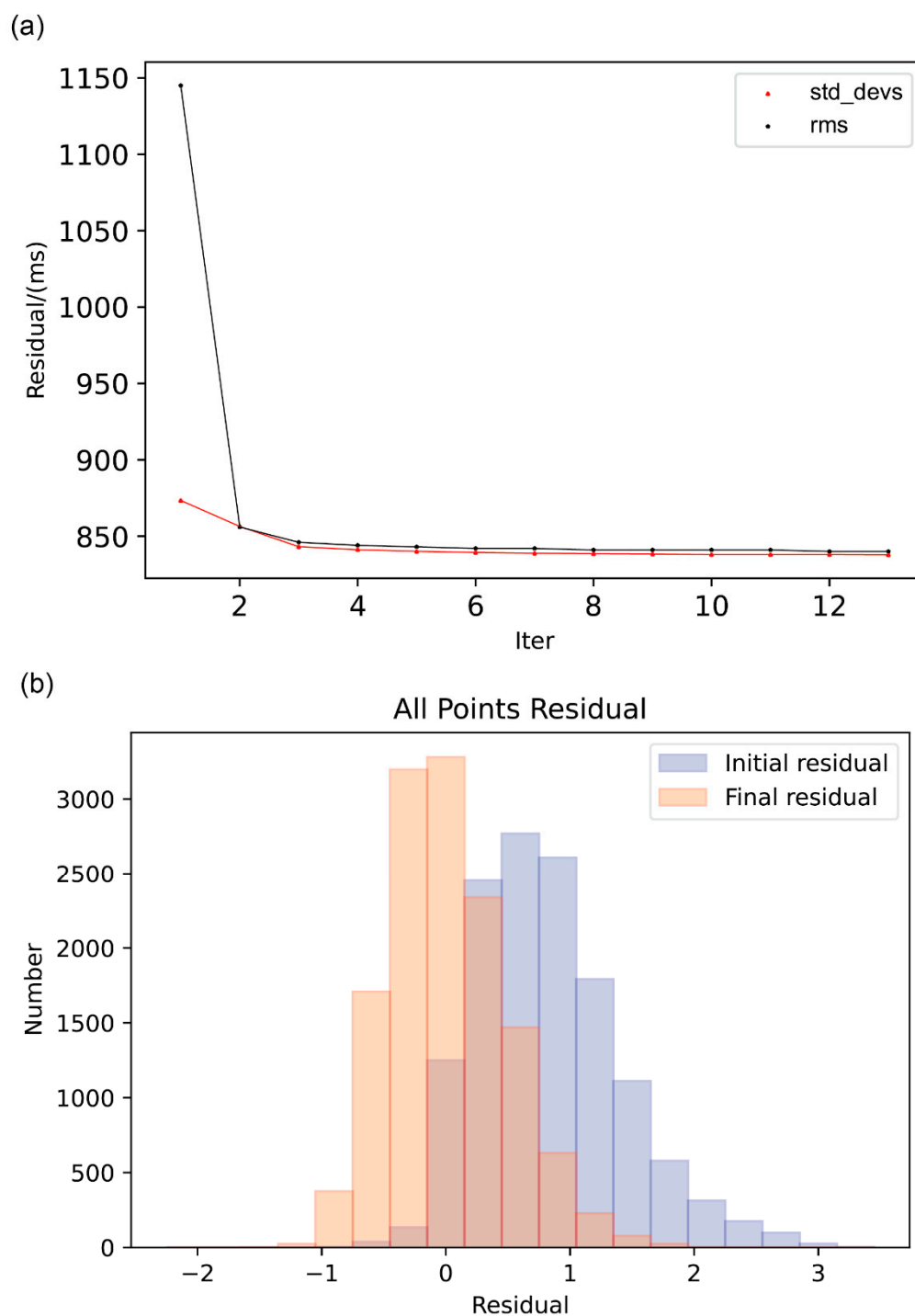
(a)

(b)

Figure S3: (a). The standard residual and RMS (root mean square) residual after each iteration. (b). Comparison of double-difference travel-time residuals. The blue histograms represent the travel-time residuals before iterations, while the orange histograms represent the travel-time residuals after thirteen iterations.
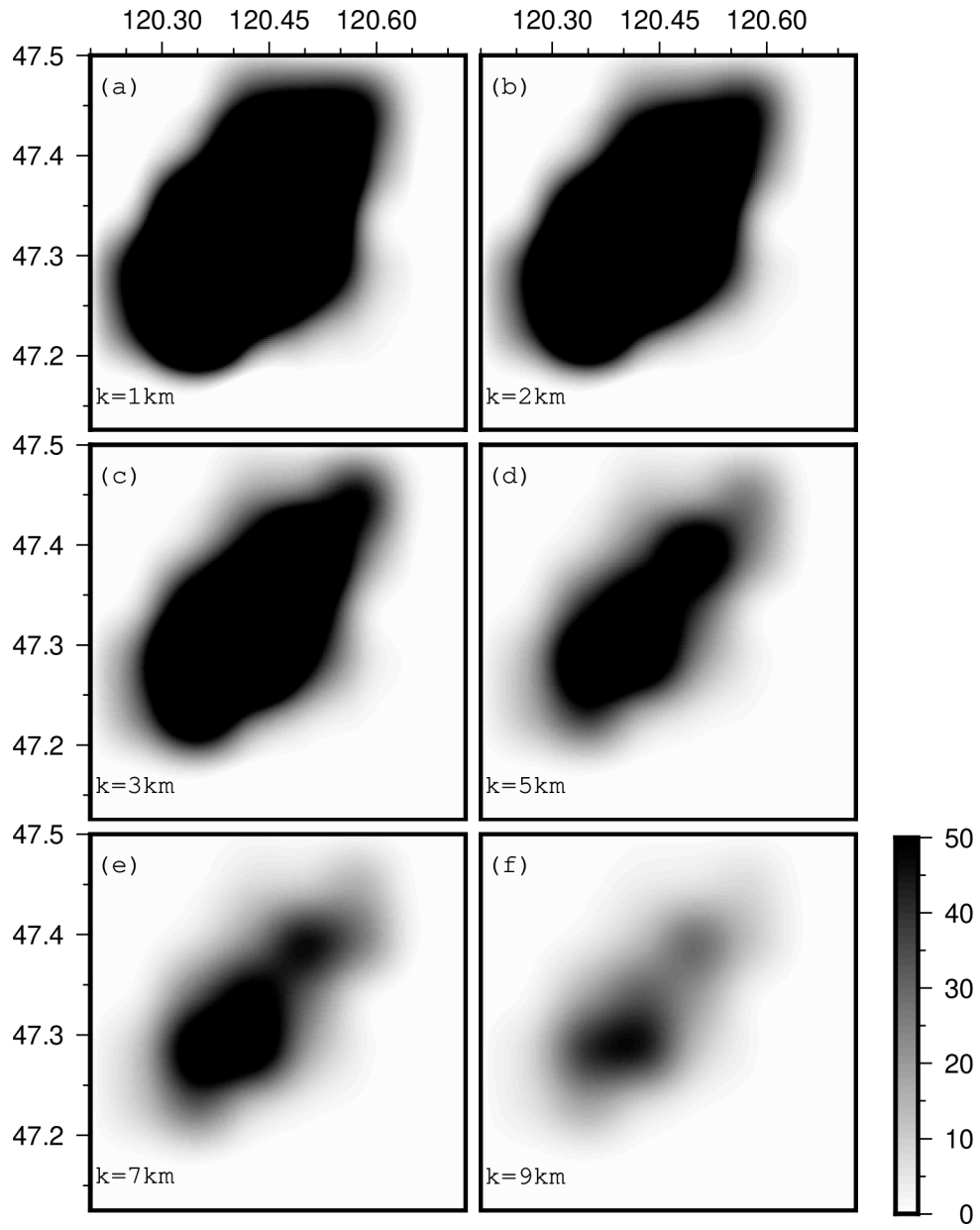
Figure S4: (a-f) The DWS distribution with a grid size of 0.055° × 0.035° for the Vs inversion. The value of the DWS for each block can be seen in the color bar. All subplots are marked with different depths at the bottom left corner.
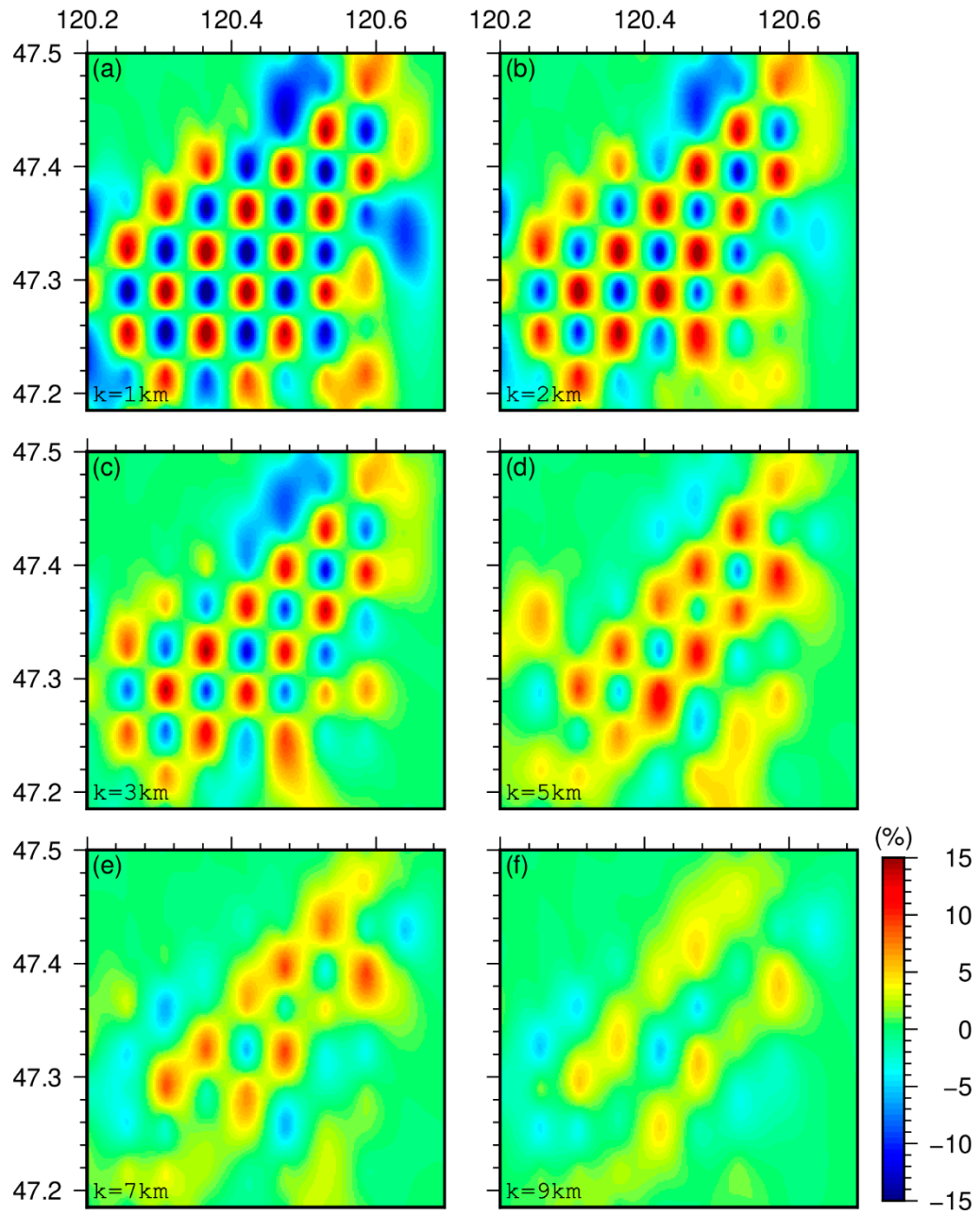
Figure S5: (a-f) Graph displaying the recovery results of the CRT. Set each block's size to 0.055°× 0.035° for Vs tomography, The value of the recovery degree for each block can be seen in the right lower corner. All subplots are marked with different depths at the bottom left corner.
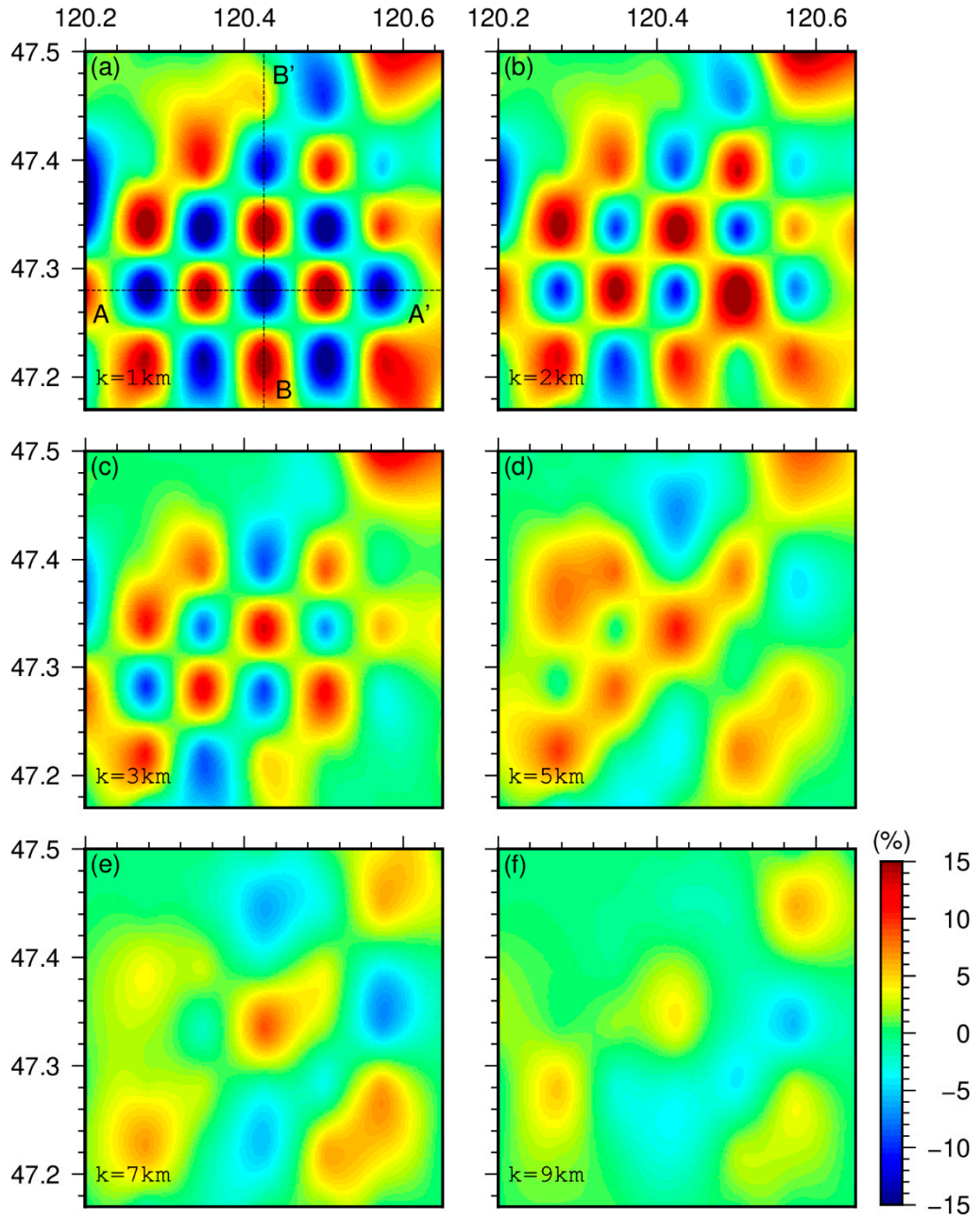
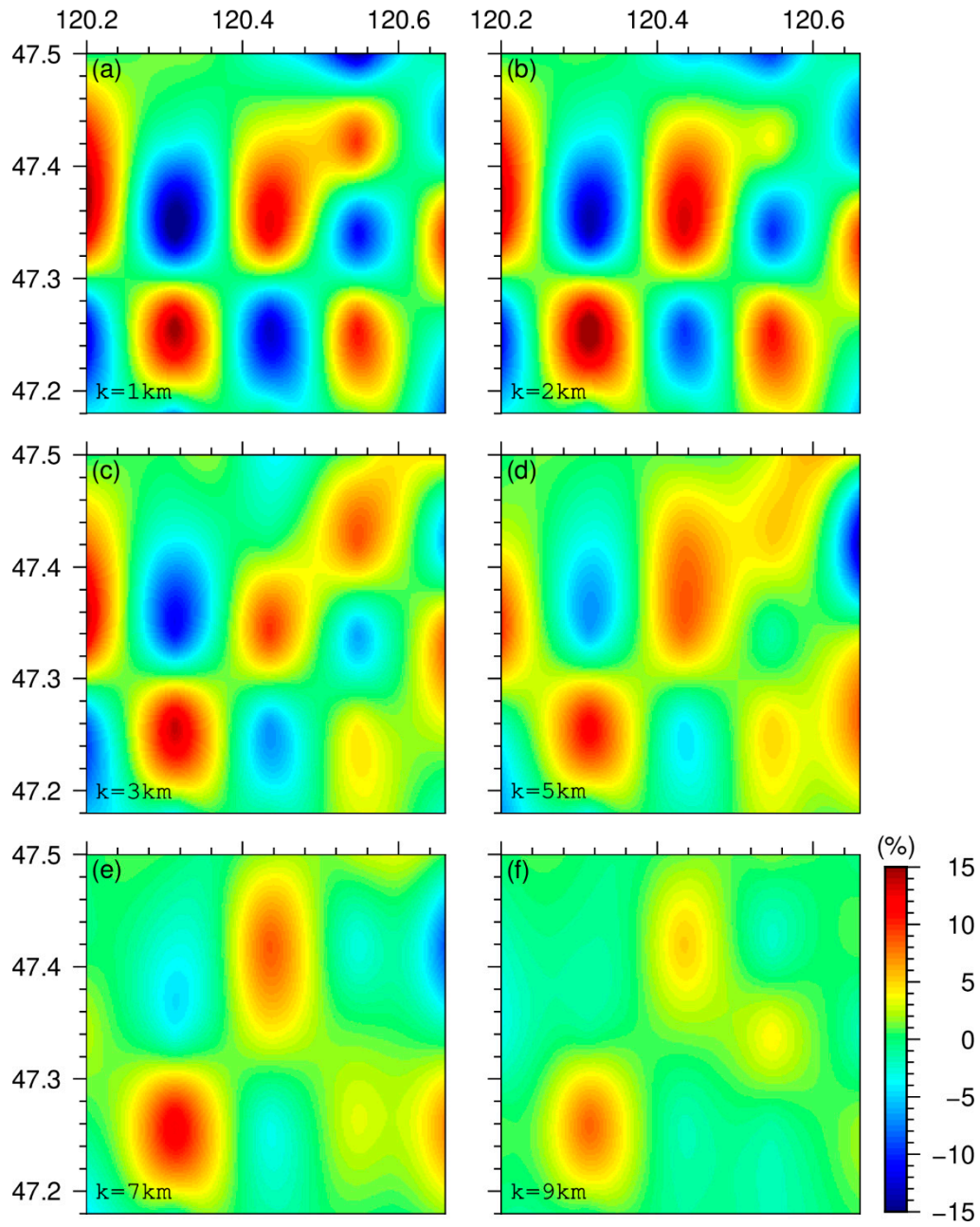**Figure S6: (a-f)** Graph displaying the recovery results of the CRT. Set each block's size to 0.075° × 0.055°.

Figure S7: (a-f) Graph displaying the recovery results of the CRT. Set each block's size to 0.115° × 0.08°.

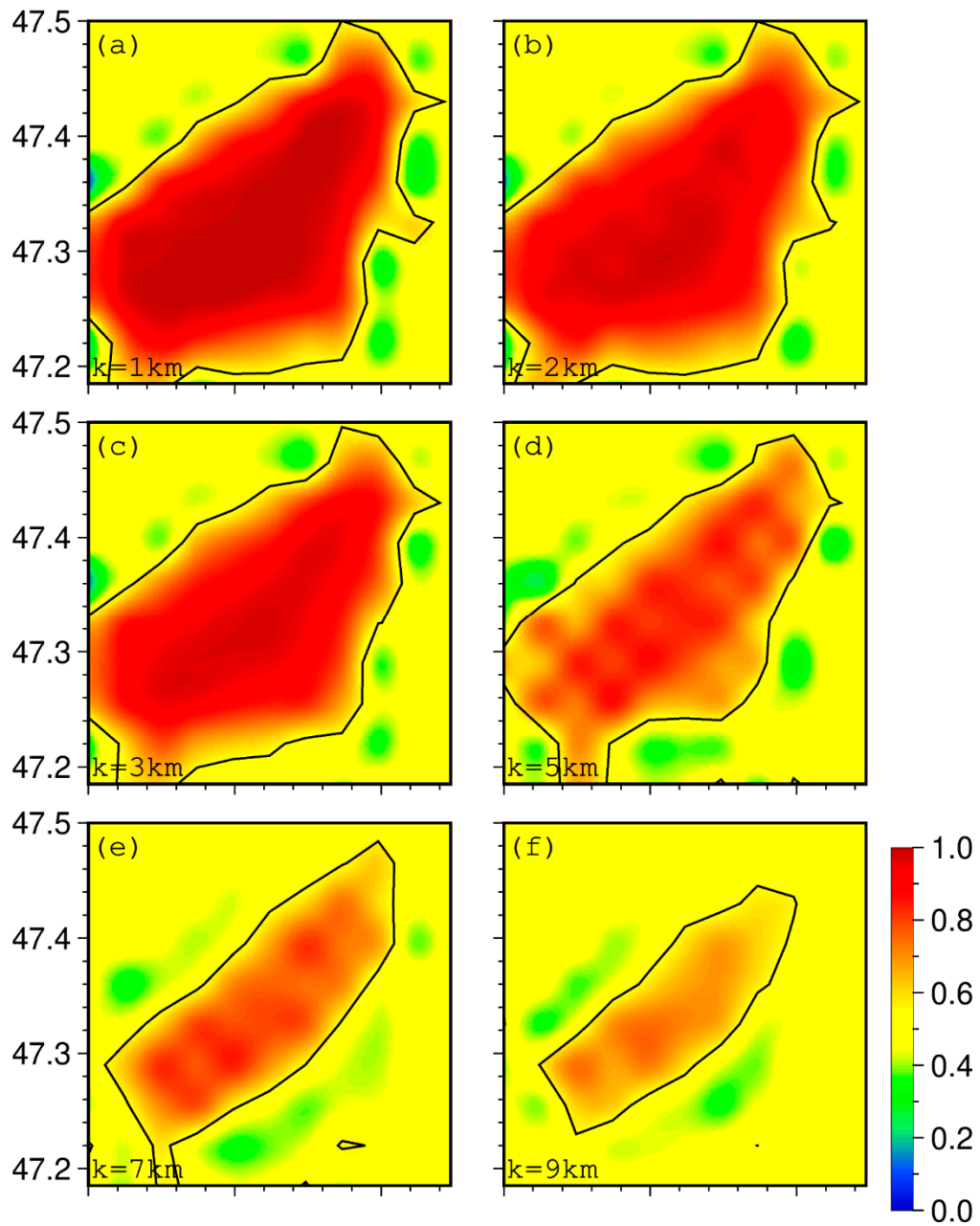**Figure S8:** (a-f) Graph displaying the recovery degree of the CRT. Set each block's size to 0.055° × 0.035° for Vs tomography. The value of the recovery degree for each block can be seen in the right lower corner. All subplots are marked with different depths at the bottom left corner.
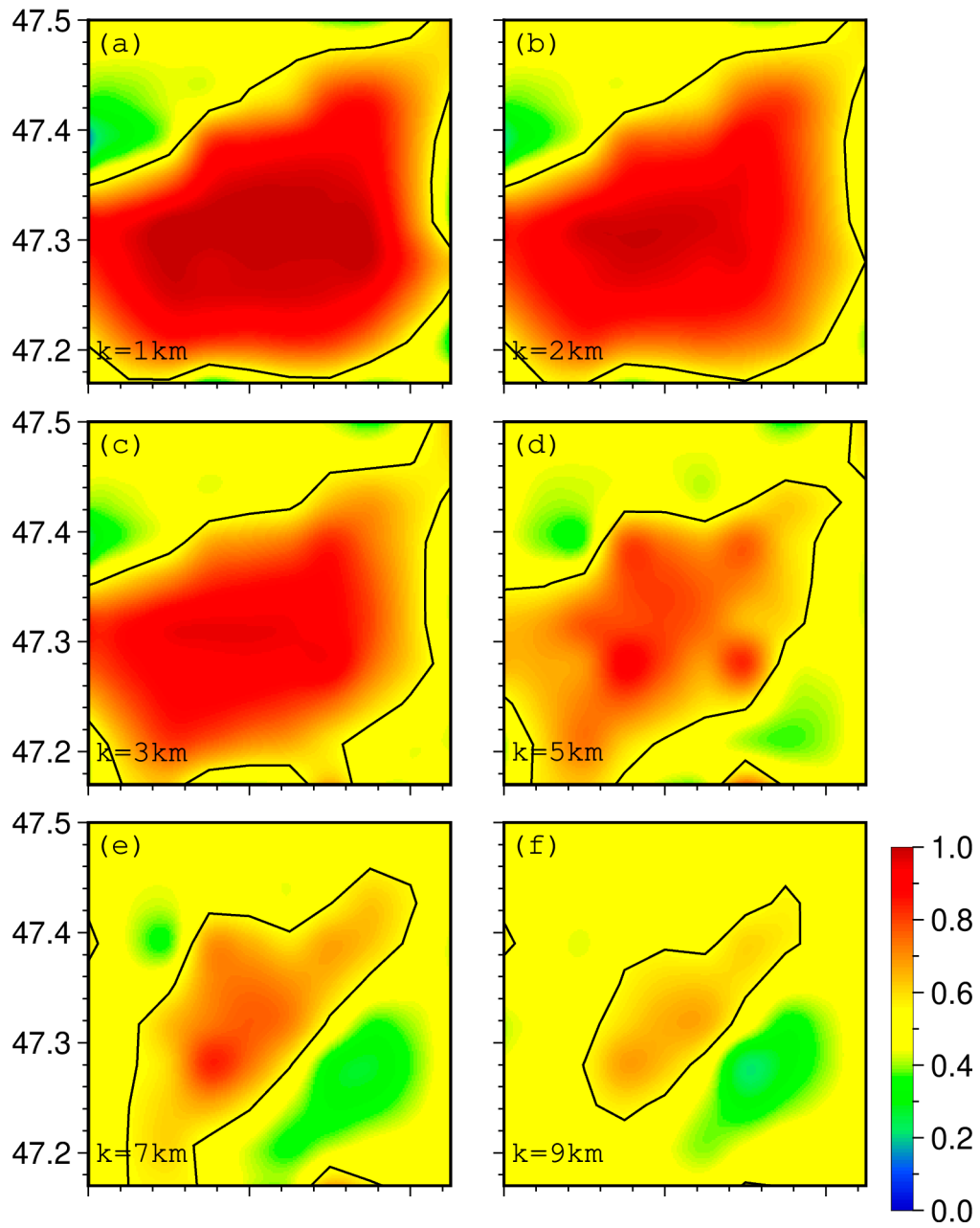
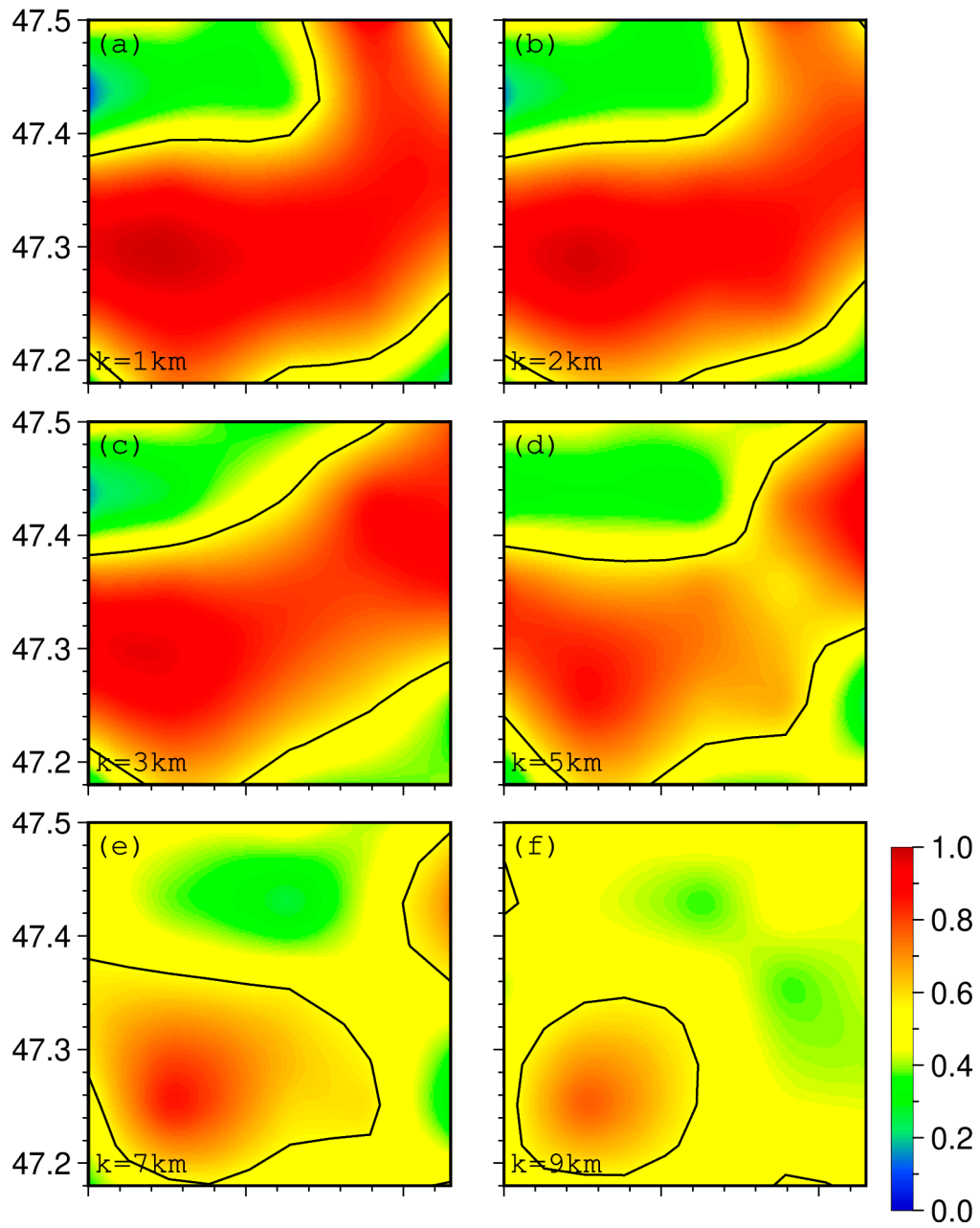**Figure S9:** (a-f) Graph displaying the recovery degree of the CRT. Set each block's size to 0.075° × 0.055°.

Figure S10: (a-f) Graph displaying the recovery degree of the CRT. Set each block's size to $0.115° \times 0.08°$.
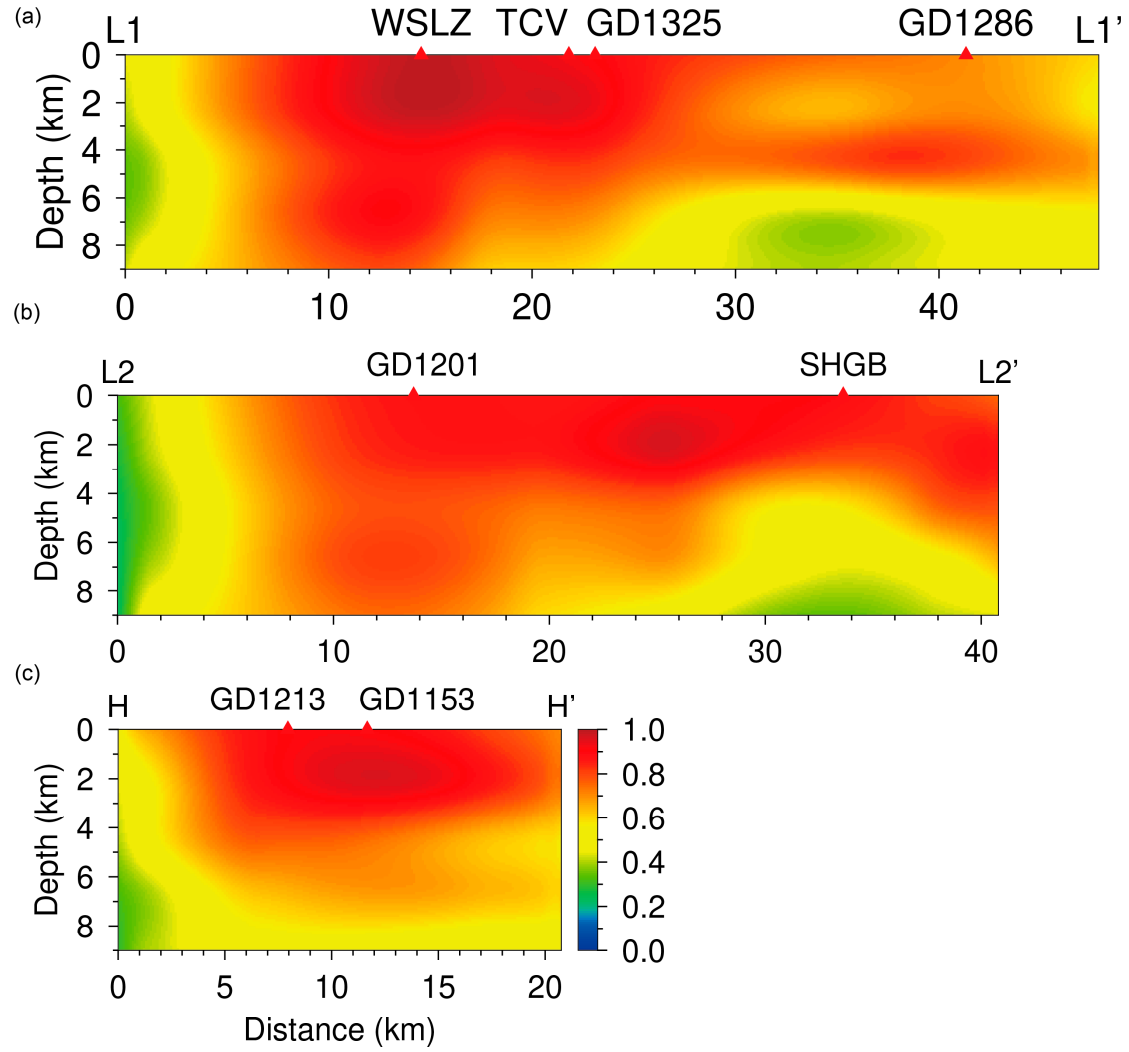
Figure S11: (a-c) Vertical profiles show the extent of CRT recovery for Vs model along three profiles (L1L1', HH', L2L2') indicated in Figure 8. The value of the recovery degree for each block can be seen in the color bar. Set each block's size to $0.075° \times 0.055°$.
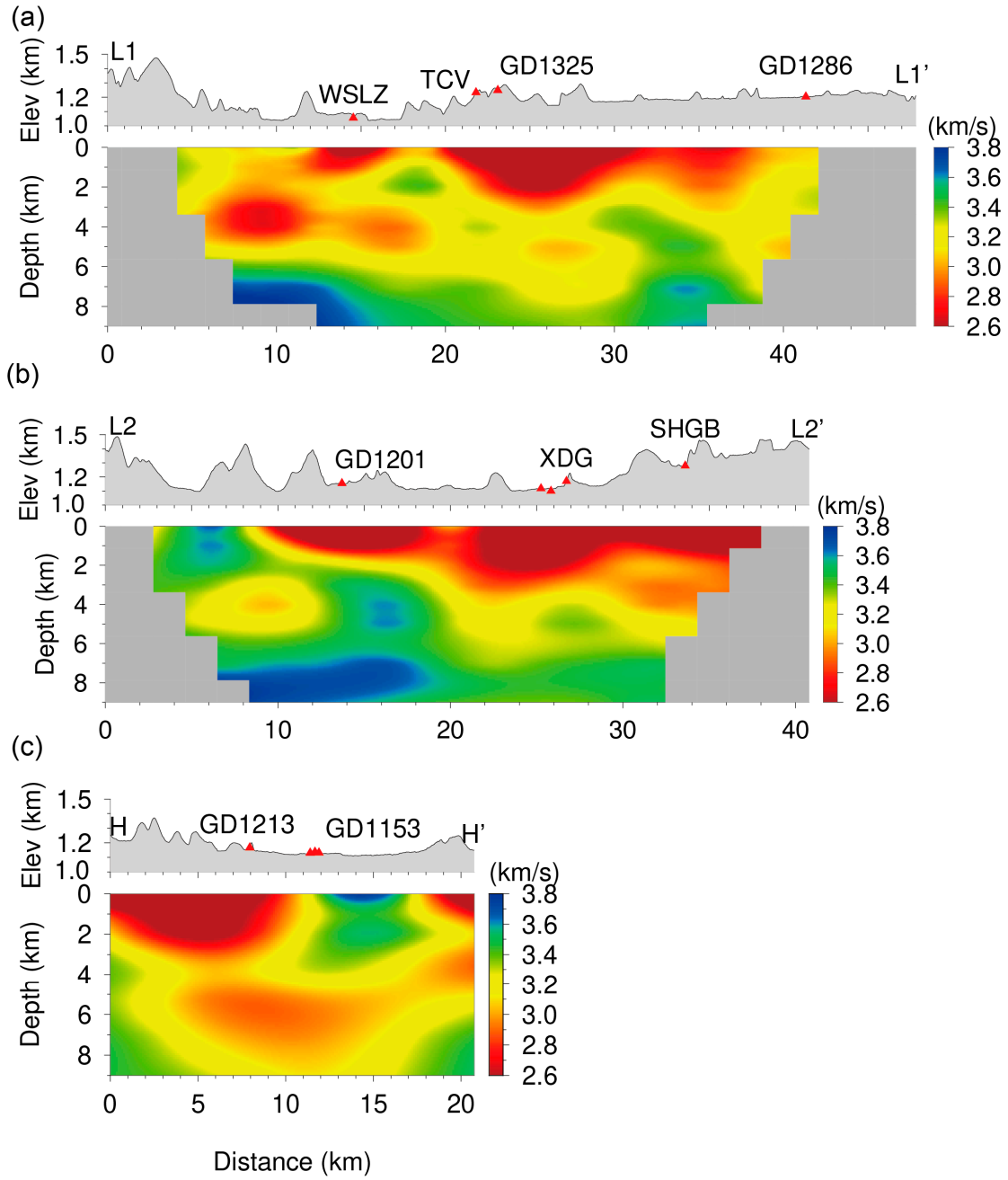
Figure S12: (a-c) Vertical profiles show the extent of CRT recovery for Vs model along three profiles (L1L1', HH', L2L2') indicated in Figure 8. The value of the recovery degree for each block can be seen in the color bar. Set each block's size to 0.115° × 0.08°.
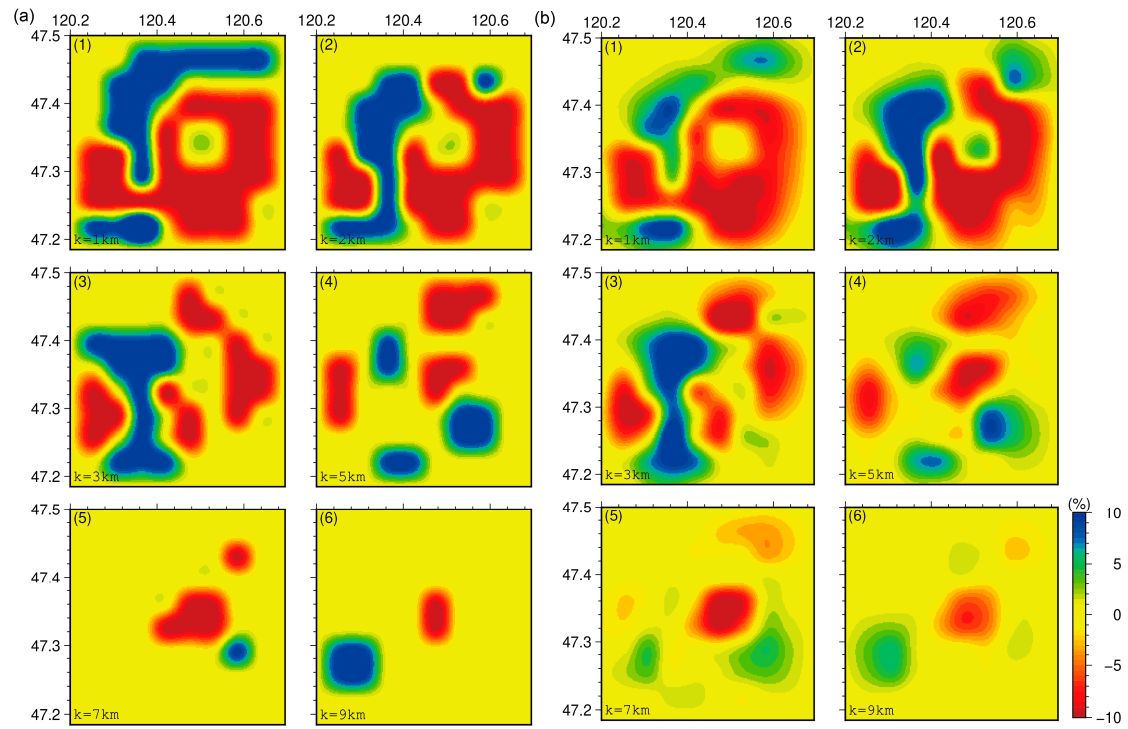
Figure S13: Graph displaying the recovery results of the RRT. The red color blocks illustrate low velocity perturbations, the blue color blocks are same as the red color blocks but for high velocity perturbations. The magnitude of the perturbation value for each block can be seen in the color bar. Set each block's size to 0.055° × 0.035°. (a) The input model of RRT. (b) restoration results of RRT.
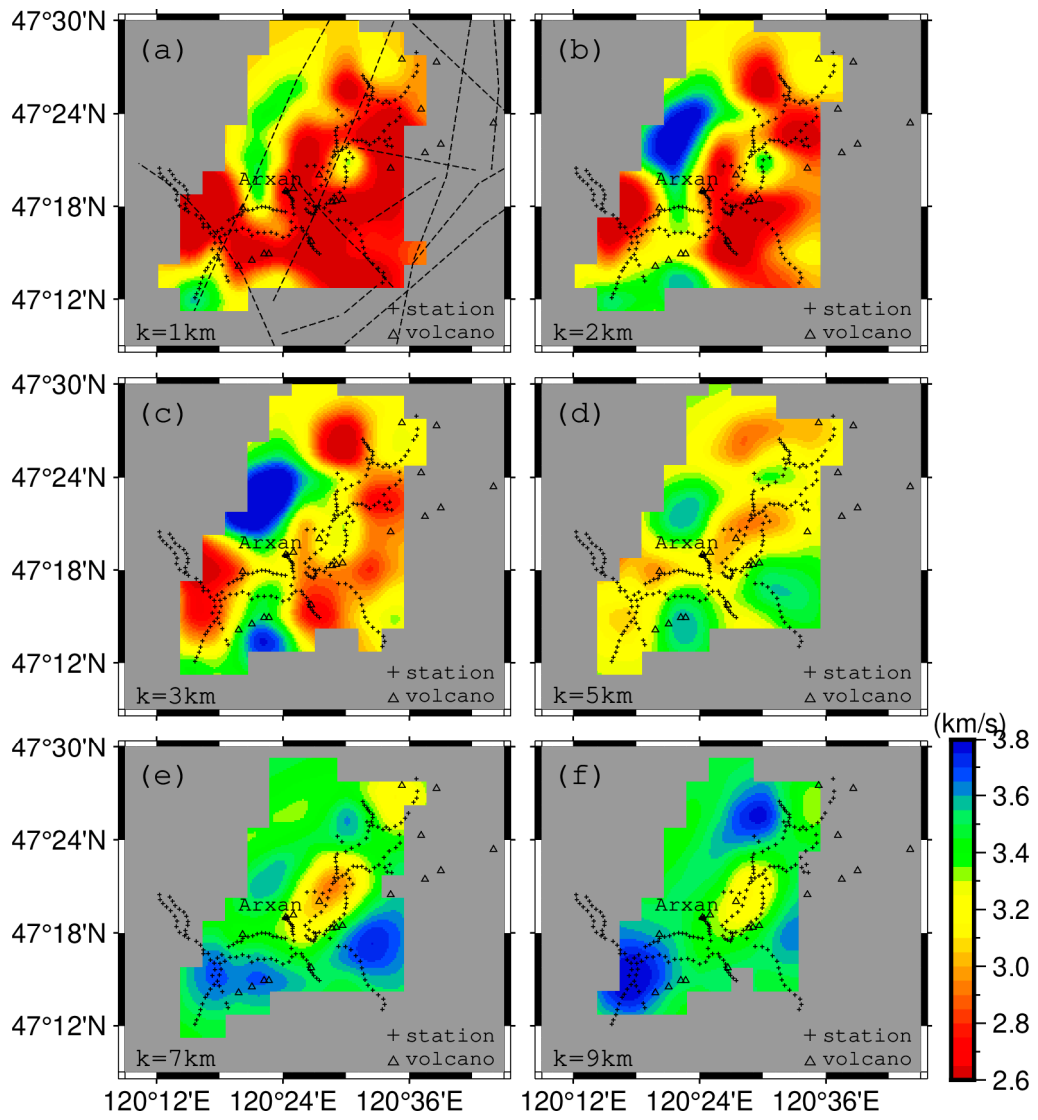
Figure S14: (a-f) Tomographic images of shear wave velocity at 1-9 km below the surface. All subplots are marked with different depths in the bottom left corner. Other labels are identical to those in Figure 7.
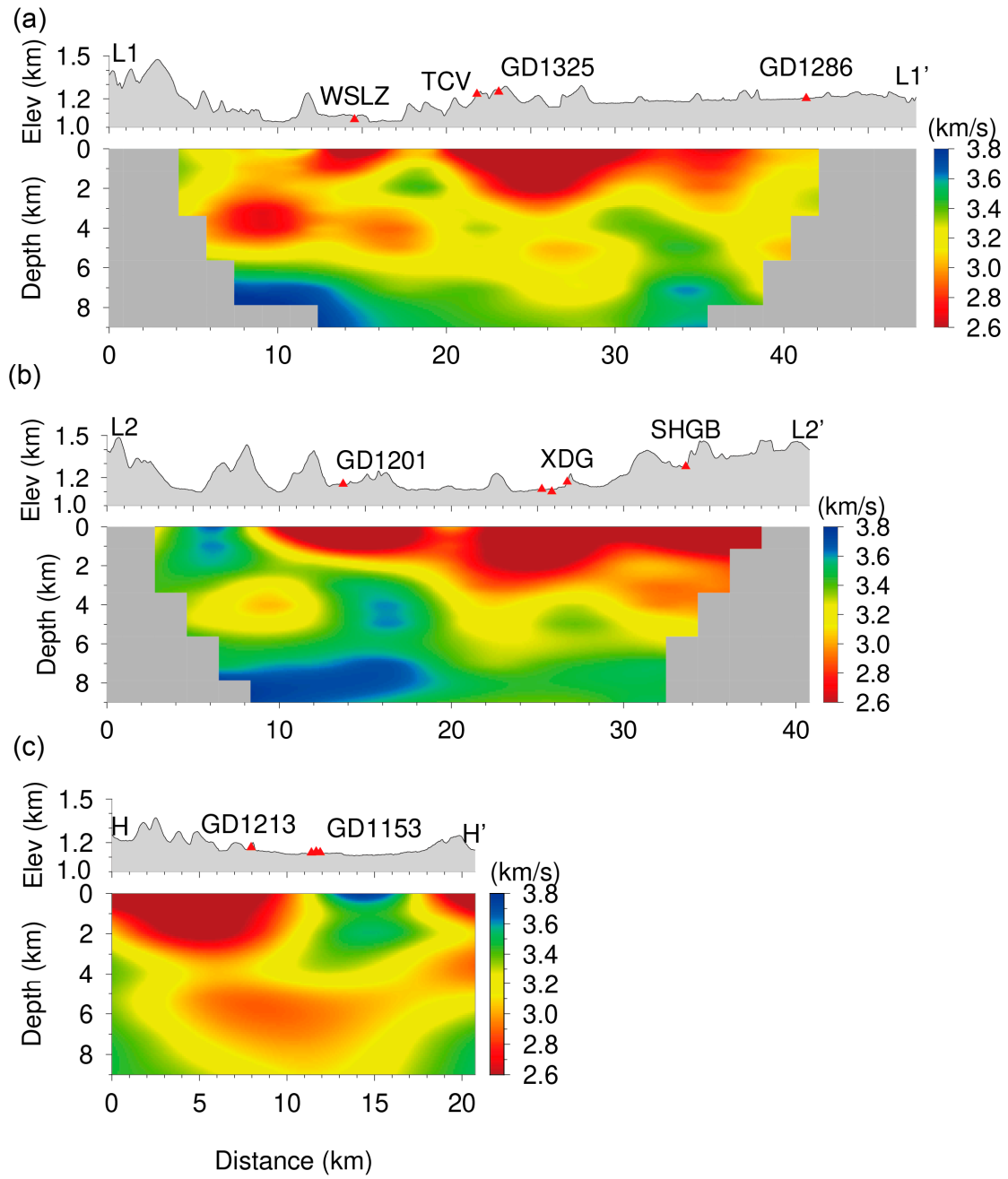
Figure S15: (a-c) Vertical profiles show the 3D Vs. The velocity of each block can be seen in the right.